EIC Detector R&D one page summary

Project ID: eRD25
Project Name: Silicon Tracking and Vertexing Consortium
Period Reported: August 2020 to March 2021
Project Leader: B.V. Jacak, P. Jones
Contact Person: L. Gonella, I. Sedgwick, E.P. Sichtermann

Accomplishments to date

- Identification of the sensor technology: 65 nm MAPS.
- First sensor submission in the chosen 65 nm CMOS imaging process.
- Development and investigation of the two Yellow Report baseline SVT detector concepts.
- Estimation of service loads and identification of targeted R&D required for power distribution.

Assessment of technological readiness

The development of a sensor tailored to the EIC specifications based on the TJ 65 nm process ITS3 development at CERN is expected to consist silicon design work leading to two MLR silicon submissions and three engineering runs. The first MLR had been submitted and will be delivered in May 2021 for testing and characterization. The submissions are expected to be placed yearly leading to the final sensor candidate delivery in 2025. The additional work developing the infrastructure to turn the sensors into a complete detector solution (mechanics, cooling, stave and disc design, interconnect technology, RDO, etc.) will take place concurrently with the sensor design effort leading to prototypes of the required detector components being available in the late 2025 timeframe. A complete plan including 180 nm sensor fallback (if necessary) is available as part of the YR.

Assessment of work remaining for a TDR

In order to reach the goal of a silicon based tracking detector design ready for TDR review it is necessary to complete the silicon design work that leads to a working prototype sensor that meets the EIC requirements and prototype designs of the vertexing detector, viable stave and disc designs, and mechanics and other infrastructure designs that demonstrate a level of maturity such that the full set of risks associated with the tracking detector are at an acceptable level for the construction project to proceed. This should include the successful demonstration of full chain of sensor prototype modules employing the higher risk technologies (interconnect, readout, cooling, mechanical stability, etc.) that show that the designs are functional and can meet the EIC requirements. At this point, the risks associated with the overall design should be reduced to an acceptable level.

Cost estimate and timeline

The timeline for the development is tied to the sensor development. This is shown below:
2021 – submission of the second MLR
2022 – submission of the first engineering run (ITS)
2023 – submission of the first engineering run (EIC variant), second engineering run (ITS3)
2024 – submission of the second engineering run (EIC variant)
2025 – integration of prototype sensors into disc and stave, possible contingency submission of EIC variant

The cost estimates for this R&D (supported by project and EICSC members) is shown below:
2022 - $1123k
2023 - $1619k
2024 - $1955k
2025 - $1278k
A spreadsheet detailing the breakdown of these costs and assumptions used is available upon request.